cold wave says that it is brought down to the earth's surface. Our first objection to this explanation is that in our American cold waves of the winter time, and in our cool waves of summer, we never experience any such low temperatures as, according to Table 1, must be prevailing above Manitoba all the year round. Neither does Paris experience the cold that is observed in the air a few miles above it. Consequently, if the cold upper air is brought down to the lower strata, and we think very likely that it is, then it must be greatly warmed up on the way down.

Our second objection to the explanation is that, according to a well established law, descending air must be compressed because it comes under greater barometric pressure, and must, therefore, be warmed, just as it is cooled by expansion when it comes under lower pressure. This is a matter of every day experience and knowledge. When air is brought down to the ground at sea level from an altitude of 10,000 meters, it must be warmed up by about 100 °C. as the direct effect of the compression. Consequently the air over Manitoba should, when it reaches the earth's surface, have a temperature of 35° C. in March, and similar high temperatures for the other months. But these extremely high temperatures do not occur in Manitoba any more than do the above-mentioned extremely low ones, and it is fair to conclude that if the atmosphere is ascending or descending, then some other law must be in operation, greatly modifying these figures. We can scarcely doubt but that the lower half of the atmosphere has some vertical as well as horizontal component in its circulation; that is to say, it is generally ascending or descending. Why then does it not arrive at the surface with the high temperatures that result from adding 100° C. to those in the 4th or 6th columns of Table 1.

One explanation is to be found in the loss of heat by radiation from the particles of air themselves, as we have attempted to explain more fully in the American Journal of Science, 1892, 3d series, vol. 43, p. 364; atmospheric Radiation and its Importance in Meteorology. (See also Met. Zeit., July, 1892, vol. 9, p. 259.) According to this, the particles of air are cooling by radiation more than they are being warmed up by the absorption of solar heat. During the long nights of autumn and winter they are of course not being warmed at all. During the short daytimes the warmth that they absorb from the sun's rays does not counterbalance the loss by radiation. But in general this absorption added to the heating produced by compression is greater than the cooling due to radiation, and, therefore, the intensely cold air of the upper layer is warmed as it descends. When its descent takes place on a gentle slope and occupies several days, then the temperature at which it reaches sea level will depend principally upon the radiation and absorption that takes place during this long interval of time. The cooling by radiation may be supposed to take place uniformly at the rate of 0.138° C. per hour, or 3.32° C. per day, if we adopt Maurer's coefficient of radiation. The absorption of solar heat partly compensates this, and gives us 2.88° C. per day as the rate of cooling. This rate of cooling would be entirely compensated by the heat produced by compression if the air descends at the rate of 288 meters per day. These figures are only approximations to what goes on in nature, but illustrate a general principle. When the upper air descends to the ground, it not only becomes relatively dry and brings with it clear sky, as was first demonstrated by Espy, but is also accompanied by a process of heating by compression, cooling by radiation, and warming by absorption, the outcome of which may be either a hot descending wind or a cold descending wind, depending wholly on the rate of descent and on the dust and moisture in the air, which control the radiation and absorption.

It is very desirable that we should have both demonstrations and measurements of the rate of ascent and descent of currents of air. In the Editor's Treatise on Meteorological Apparatus and Methods, some anemometric arrangements are mentioned by which the inclination of the winds to the horizon are supposed to be measured, but these are, in general, very unsatisfactory.

Perhaps the most convincing demonstration of the gentle slope of ascending currents is to be found by watching the slowly circling descent of buzzards and birds of prey, tracing for a hundred miles some little streak of foul air that proceeds from the carrion on the ground far away to the high altitudes at which these birds were soaring. The general slope of such a rising current is often as small as 1°.

The observations of the clouds with the nephoscope generally assume that we are observing the strictly horizontal component of motion. But the vertical component is also revealed by a proper discussion of the observations, and a general slope of 5° over the whole cloud layer visible at any station has sometimes been demonstrated by observations with the perspective nephoscope described in the above-mentioned Treatise on Apparatus and Methods. By another independent method, Mr. Louis Besson, of the Observatory of Montsouris, has lately been able to show that ascending and descending inclinations as large as 14° have been demonstrated in the clouds over Paris for the cirrus, alto-cumulus, and fracto-cumulus clouds. An excellent account of Besson's method is given in the Meteorologische Zeitschrift for September, 1903.

Any contribution to the subject of the vertical component of atmospheric motions will be welcome to the meteorologist.

PROPORTION OF RAINFALL AVAILABLE FOR PLANT USE.

A recent letter from Mr. Thede P. Blake, of Lamar, Nebr., asks:

> What proportion of our rainfall, in Chase County, Nebr., is absorbed by the dry sandy subsoil, and thus taken below the reach of plant roots?

In reply to this letter the Chief of the Bureau of Soils, Prof. Milton Whitney, states:

> We have no data regarding the character of the soil and subsoil of Chase County, Nebr., and consequently it is not possible to give any very definite answer to Mr. Blake's inquiry. In general a rainfall not exceeding 1 inch would probably be held in the upper 18 inches of a loam or clay soil sufficiently long to make the greater part of it available to the plant. This statement is made on the assumption that the soil was rather dry before the rain. A rainfall of 1 inch would increase the moisture content of the upper 18 inches of soil 7 per cent, and such a variation is not abnormal in a clay loam. If the rainfall is sufficient to saturate the soil, a considerable portion would pass into the subsoil and beyond the reach of the roots, although a part of this would be recovered through capillary action.

STATIONARY AND WHIRLED PSYCHROMETERS.

In 1886 the Weather Bureau introduced the use of the whirled psychrometer and the thin muslin covering to the wet bulb, in place of the stationary wet bulb and the thick wicking that had been used for covering. It is generally understood that the whirled psychrometer and the stationary wet bulb agree well enough when the wind velocity is 10 miles per hour or more, but may differ considerably for gentler winds and calms. There is also a decided difference between the wet bulb when covered with very thin clean muslin, and when covered with comparatively thick and oftentimes dirty cotton wicking. In fact the theory of the psychrometer assumes merely the existence of a thin film of water, and the use of a thick wicking necessitates the introduction of a new term in the formula.

It is desirable to investigate the corrections necessary in order to reduce the earlier Weather Bureau observations to the modern standard of the whirled or ventilated psychrometer. Especially is this necessary before we can reduce to the modern standard the records made by self-recording wet bulbs, where no artificial ventilation is practicable, and which consequently show a diurnal periodicity due to the stronger winds that prevail from 9 a. m. to 4 p. m.

METEOR OBSERVED AT SOUTH BEND, IND.

Mr. W. T. Blythe, Section Director, Indianapolis, Ind., forwards the following note by Mr. H. H. Swaim, Voluntary Observer at South Bend, Ind.:

I was waiting at our railroad depot for the train to Indianapolis to start when, at 4:50 a. m., September 15, 1902, a very bright meteor passed across the eastern horizon from south to north at an altitude of not more than 15° above the horizon, leaving a fiery trail, which disappeared as the sun rose. The atmosphere was somewhat hazy at the time and the first appearance of the sun was natural, but as it reached the altitude at which the meteor passed it assumed a peculiar tint, changing from pink to blue, like a blue gas, and later to a clear white, like the electric light. During the earlier stages of this phenomenon a person could easily look at the sun with the naked eye. My observation of the sun's appearance was made from the railroad train.

The color of the sun as seen through hazy and cloudy air varies with the smallness of the particles of haze; it may be red, pink, yellow, green, or blue, passing from one end of the spectrum to the other as the particles change in size, and again passing through a second and a third series of changes as the particles grow larger, until finally they become too large to produce this effect. All these changes are elaborately described in the experimental work of Prof. Carl Barus, published as Bulletin No. 12 of the United States Weather Bureau, Report on the Condensation of Atmospheric Moisture. The whole subject is one of equal importance to molecular physics and meteorology and is still being investigated by Professor Barus.

The presence of a slight haze is so common and has such a decided influence on the color of the sun that we should naturally attribute to it the pink and blue colors observed by Mr. Swaim. We believe the first observation of this kind was made about 1840, by Mr. J. D. Forbes, when he accidentally viewed the sun through a column of steam issuing from a locomotive; and this led him to his beautiful investigation on the influence of moisture in the atmosphere, the sunset colors, and kindred phenomena. The quantity of gas or vapor constituting the trail of a meteor is so exceedingly slight that we could not expect it to affect the color of the sun. Nevertheless, the suggestion by Mr. Swaim is worthy of consideration. In the present case, however, nearly an hour must have elapsed before the sun could have risen to the altitude of the meteor trail so as to be seen through it, and by that time the trail must have become extremely attenuated. South Bend is in a region where the whole atmosphere is permeated with gases and smoke from soft-coal fires, so that the special influence of gases or dust from meteors is not likely to be appreciable.

In general the long trails that are sometimes left floating behind a meteor are supposed to demonstrate the existence of an atmosphere at great altitudes, and as these trails frequently change their shapes within a few minutes these changes are said to indicate something with regard to the winds prevailing at that high altitude. All observations that can be gathered on this subject are desirable as a possible contribution to the meteorology of the highest atmosphere, but all argumentation and deductions must be held in abeyance until more accurate observations have accumulated.

TERRESTRIAL GLOBES.

Several requests have come from stations desiring terrestrial globes, especially such as show some general meteorological phenomena. Observers will regret to learn that it is at present impracticable for the Central Office to purchase and distribute such globes. On the other hand, as nothing contributes to clearness in our geographic and meteorological conceptions more than the handling of the globe, the Editor suggests that teachers and students either correspond with those who make a cheap and practicable form of globe such as the American Book Company, or Ginn & Company of Boston, or still better try to make one themselves. Nothing better impresses a student than handling the figures, or drawing the lines, or shading the areas that occur in meteorology. As a practical part of every course in meteorology it has always been customary to require the student to transform columns of figures into curves or charts. Just as one makes the morning chart from the manuscript reports, so one may profitably transfer to a globe the figures or the diagrams that are usually published on the plane surface of the pages of a text book or atlas. The main trouble is to obtain a spherical surface. Plain globes with a surface adapted to the use of chalk, slate pencil, or ink are sold by several companies. Perhaps the most convenient and inexpensive globe consists of a large india rubber ball. Balls of 3 to 8 inches in diameter have been used with great success. One may write on these with ink, paint them with water colors, and wash them clean at will. The lines for the equator and the circles of latitude can be left on them permanently. A chart of rainfall or temperature or pressure drawn on the usual Mercator projection becomes more instructive when transferred to such a globe, and we hold it as very important that all school children should be familiar with this true presentation of the meteorological features of the earth.

PERIODIC FLOODS IN THE MISSISSIPPI.

Referring to our note on page 423 of the MONTHLY WEATHER REVIEW for September, 1903, a recent letter from Dr. Cyrus Thomas states that his attention was called to the periodicity of rainfall, chiefly by the general belief of the people of the Mississippi Valley in the periodicity of high water in that river. This belief was current among the aborignies. They looked for it every fourteen years. It is mentioned by De Soto's Chroniclers (See Garcilaso de la Vega, Lib. 5, pt. 2, Chap. VII, p. 222, 1722; and Shipp, Hist. Hern. De Soto, 450, 1881.)

ISLAND STATIONS IN THE SOUTH ATLANTIC OCEAN.

Lieut H. Ballvé, of the Argentine Navy, announces that the Government of the Argentine Republic has determined to give a permanent character to the first class Meteorological and Magnetic Observatory on the island of Año Nuevo, see fig. 1, situated in the vicinity of the Island des États (Staten Island) in latitude 54° 39′ south, and longitude 64° 07′ 30″ (4^h 16^m 30^s) west of the meridian of Greenwich, and which was established in order that the Republic might cooperate with the International Antarctic Expedition.

The island of Año Nuevo is very small and elevated but little above sea level, and we have, therefore, been able to install the observatory under excellent conditions at a distance of only 6 miles, or 12 kilometers, from the mountains of Staten Island. Consequently the observations recorded there must agree essentially with the climate of this region.

A pamphlet giving a full description of the outfit will soon be published, at present it need only be said that the observatory possesses a complete instrumental outfit, such as is appropriate to a station of the first order.

At the end of this present year the observatory will begin the publication of the results obtained during the International Antarctic Expedition, as also of the observations for the present year. Thereafter the results of the observatory will be published regularly.

An exchange of publication is desired. All correspondence